Nutrition Literacy and Risk Perception of Food Additives and Processed Foods Among Students: A Cross-Sectional Study

Research Article

Abraham J* and Godwin L

Department of Home Science, Morning Star College, Angamaly, Kerala, India

*Corresponding author: Jiby Abraham, Department of Home Science, Morning Star College, Angamaly, Kerala, India. E-mail Id: jibyabrahams20@gmail.com

Abstract

Introduction: The concept of "nutrition literacy" can be defined as a set of personal attributes and context-related traits that facilitate adherence to a nutritious diet, prepared in accordance with appropriate nutritional rules and guidelines. It is necessary for the promotion of healthy dietary habits, and especially important for students who are faced with new levels of independence and options. Misinformation about food additives and processed foods prevails that may result in improper eating practices, or misplaced concerns about food safety.

Aim: The present investigation examined functional, interactive and critical aspects of nutrition literacy, as well as risk perception towards food additives and processed foods among undergraduates in Kerala, India.

Methodology: Between December 2023 and February 2024, a cross-sectional survey was conducted with 452 randomly selected undergraduates from four varied colleges. A validated piolet-tested tool assessed sociodemographic, nutrition literacy and risk perceptions, with reliability indexes (Alpha-Cronbach:0.84–0.83) indicating internal consistency. Descriptive statistics was used in analysing the data in SPSS v28.

Results: While a majority of students demonstrated an understanding of basic nutrition principles, there was only a limited understanding and confidence in the application of knowledge as indicated by the relatively high proportion of neutral responses. The majority (68.3%) made use of digital sources for information; however, the critical evaluation and interpersonal discussion of nutrition was less common. The findings of the study indicate that students possessed little nutrition awareness but lacked in-depth knowledge, critical thinking and evidence-based reasoning about food additives and processed foods.

Conclusion: Results emphasise the importance of addressing more specific and targeted educational interventions that promote functional, interactive and critical nutrition literacy, given the key role they play in promoting healthier, more science-based food choices.

Keywords: Nutrition Literacy; Risk Perception; Food Additives; Processed Foods

Introduction

Nutrition literacy, the capacity to access, process, understand, and use the nutrition information required to make appropriate nutrition decisions, has come to be a key determinant of dietary behavior and health status among students. This group is undergoing distinct phases of independence and self-feeding [1-3]. Recent studies have shown that a large percentage of students in the world have an insufficient or marginal level of nutrition literacy, and that the level could differ according to gender, major field of study, economic status, and exposure to nutrition education [4-6]. For example, a high prevalence of poor nutrition knowledge was reported among >40% of the college students in Saudi Arabia that was significantly associated with unhealthy eating practices including high intake of processed food items and sugar-sweetened beverages[1]. At the same time, increasing concerns have emerged related to the risk perceptions of both food additives and processed foods among young adults. Food additives, with strict regulatory treatment, are indispensable

in modern food production, but receive a lot of backlashes due to negative media coverage, lack of acceptance from consumers, continue incident on food safety [7-10]. Also, processed foods are ubiquitously associated with bad health among students, reinforced and to some extent influenced by front-of-package nutritional warning labels and heuristic judgments on the basis of level of processing [11-14]. Different facets of risk perception – performance risk (risk of unmet food expectation), physical risk (potential health hazard) and psychological risk (regret or disappointment decision makers have from undesirable choices) affect avoidance and the intention to health selecting options. It is important to understand the impact of nutrition literacy on risk perception since low literacy might lead students to overestimate the risk of food additives and processed food with the possible consequence of unnecessary dietary restrictions or, conversely, to underestimate real risks .By addressing these gaps with targeted nutrition education, students can gain the ability to critically evaluate the information they receive about food and make informed food choices that are also good for public health [15]. Therefore, exploring the relationship between nutrition literacy and risk perception among students is crucial for developing effective interventions aimed at enhancing food-related decision-making during this formative period.

The intersection between nutrition literacy and risk perception is thus critical in understanding how individuals interpret, evaluate, and respond to chemical health risks in their dietary environment. However, there remains a dearth of empirical data exploring this relationship in low- to middle-income country contexts, where regulatory oversight and education systems are still evolving. This study aims to assess the levels of nutrition literacy and risk perception regarding food additives and processed foods among undergraduates. By identifying knowledge gaps and misperceptions, the findings may inform public health strategies, curriculum development, and regulatory frameworks aimed at minimizing chemical health risks through improved food-related decision-making.

Methodology

Study Design and Setting

This study employed a cross-sectional survey to assess the level of nutrition literacy and the perception of chemical risks associated with food additives and processed foods among undergraduates students. The data was collected by survey method between oct 2023 to January 2024 from four colleges located in Alappuzha District, Kerala, India. These institutions represent different academic disciplines, like science, arts and commerce, thereby variability in student background.

Study Population and Sampling

The target population consisted of undergraduate students aged 19 to 23 years, enrolled across various disciplines. A multi-stage stratified random sampling approach was employed: The undergraduates were divided into strata of science, arts and commerce streams. Within each stratum, simple random sampling was used to select undergraduates. A total of 452 with 50% male and 50% female students were selected in the study with inclusion and exclusion criteria.

Inclusion criteria were: currently enrolled undergraduate student, aged 19-23 years, provided informed consent and able to understand a self-administered English questionnaire.

Exclusion criteria included: Postgraduate students, those with diagnosed cognitive or psychiatric conditions affecting comprehension

Using Cochran's formula for cross-sectional studies and assuming a 50% prevalence (to maximize sample size), a 95% confidence interval, and 5% margin of error, the minimum sample size was estimated at 384. To account for non-response or incomplete submissions, the final target was 500 undergraduates, with 452 complete responses retained for analysis.

Instrumentation

A well-structured questionnaire was developed in English, which was validated through expert review and pilot tested on 100 undergraduates. The instrument consisted of two sections: Sociodemographic profile of the undergraduates which consisted of age, gender, year of study, area of residence, monthly income. The second section was Nutrition literacy assessment developed by Gibbs et al. (2018) and modified for cultural relevance. Domains included Functional, Interactive, Critical nutrition literacy. Items used a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Validity and Reliability

The face validity and content validity was assessed by a panel of experts in nutrition, public health and toxicology. A pilot study was conducted to examine the clarity, reliability and completion time. The data of the pilot study were not included in the final data analysis. Cronbach's alpha was calculated for nutrition literacy scale, risk perception scale and overall internal consistency, Cronbach's alpha was 0.84,0.78,0.83 respectively for all the scale.

Data Collection Procedure

Data was collected between December 2023 to February 2024. The personal interview was conducted by the research scholar to collect data. Participation was voluntary, anonymous, and guided by an informed consent process.

Ethical Considerations

Written or digital informed consent was obtained from all participants prior to data collection. No personal identifiers were collected.

Data Management and Statistical Analysis

Data were coded and entered into **IBM SPSS version 28.0** for analysis. The following steps were undertaken

Results

The assessment of the functional nutrition literacy of undergraduate students indicates that, in spite of moderate familiarity with basic principles of nutrition, their literacy is superficial and sporadic. While most undergraduate students asserted awareness of basic principles such as a balanced diet (56.6%) and food preservation methods (51.1%). Many undergraduate students presented confusion

Table 1: Functional Nutrition Literacy among students

FUNCTIONAL NUTRITIONAL LITERACY	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I am familiar with the concept of a 'balanced diet'	57(12.6)	70(15.5)	69(15.3)	202(44.7)	54(11.9)
I am familiar with the food pyramid.	45(10.0)	48(10.6)	136(30.1)	145(32.1)	78(17.3)
When I read an article about nutrition, food or diet I find words that I can understand	28(6.2)	47(10.4)	141(31.2)	153(33.8)	83(18.4)
I know to preserve foods through food preservation methods like drying, pickling etc	35(7.7)	108(23.9)	78(17.3)	190(42.0)	41(9.1)
I am familiar with World Health Organisation (WHO) recommendation for daily intake of fruits and vegetables	32(7.1)	28(6.2)	172(38.1)	160(35.4)	60(13.3)
If some ingredients of a recipe is not available, I can change the recipe according to available ingredients	57(12.6)	82(18.1)	59(13.1)	190(42.0)	64(14.2)
When I have to eat outside, I can choose foods which are healthier	58(12.8)	70(15.5)	109(24.1)	141(31.2)	74(16.4)

Table 2: Interactive Nutrition Literacy among students

INTERACTIVE NUTRITIONAL LITERACY	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I actively seek out and use digital resources (Websites,apps etc) to expand my knowledge of nutrition	13(2.9)	53(11.7)	77(17.0)	237(52.4)	72(15.9)
I engage in discussions or forums related to nutrition and unhealthy eating on social media or online platforms	72(15.9)	53(11.7)	110(24.3)	118(26.1)	99(21.9)
I discuss about diet with my friends, family and relatives	189(41.8)	109(24.1)	71(15.7)	35(7.7)	48(10.6)
I have changed my eating habits based on the information about diet that I have gathered	119(26.3)	100(2.1)	89(19.7)	79(17.5)	65(14.4)
I readily take the initiative to discuss with dietary experts (for example a doctor, nurse or the like) about healthy eating.	106(23.5)	44(9.7)	142(31.4)	84(18.6)	76(16.8)
I easily accept food and nutrition information I receive from virtual networks, and research about their truthfulness	118(26.1)	103(22.8)	109(24.1)	67(14.8)	55(12.2)

Table 3: Critical Nutrition Literacy among students

CRITICAL NUTRITIONAL LITERACY	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I critically evaluate nutrition information and claims I come across in the media	103(22.8)	113(25.0)	129(28.5)	78(17.3)	29(6.4)
I try to influence others (for example my family and friends) to eat healthy food.	135(29.9)	95(21.0)	103(22.8)	63(13.9)	56(12.4)
I tend to be influenced by the dietary advice I read in newspapers, magazines etc	106(23.5)	136(30.1)	96(21.2)	20(4.4)	94(20.8)
I am willing to take an active role in measures aimed at promoting a healthier diet at my college.	77(17.0)	63(13.9)	150(33.2)	72(15.9)	90(19.9)
When I read information about nutrition, diet or food it is important to me that it is based on scientific evidence.	105(23.2)	91(20.1)	138(30.5)	65(14.4)	53(11.7)
I would readily get involved in political issues targeted at improving people's diet in Kerala	97(21.5)	93(20.6)	105(23.2)	89(19.7)	68(15.0)

Table 4: Risk Perception of Food Additives and Processed Foods among Students (n = 452)

Statements	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
For my long term health food additives are harmful	6.4	12.2	21.5	38.9	21.0
Due to artificial ingredients I avoid processed foods	5.1	11.5	17.0	41.2	25.2
I feel anxious after consuming foods with preservatives or additives.	10.0	15.3	28.1	32.5	14.1
Processed foods are less nutritious than fresh or whole foods.	3.1	7.3	14.8	46.9	27.9
I trust labels that highlight the presence of additives or chemicals.	7.7	14.6	33.0	31.6	13.1

Table 5: Correlation between Gender and Risk Perception of Food Additives (n = 452)

Variable	ρ (Spearman's rho)	p-value	Direction	Strength
Gender and Risk Perception score	+0.09	0.182	Positive	Weak

in the response of more technical points of nutrition. For instance, 30.1% of the undergraduate students were neutral when they were asked about the food pyramid, whereas 38.1% of them were uncertain regarding recommendations of the World Health Organization regarding consumption of fruits and vegetables. Furthermore, almost a third of the students presented difficulty in the understanding of nutrition-specified vocabulary or in the making of healthier decisions when they dined out. As illustrated in a litany of research studies, the awareness of the undergraduate regarding nutrition is sporadic and superficial, despite moderate familiarity with basic principles [16].

The high rate of indifferent response could also reflect passive exposure to messages, rather than active processing or understanding. With so much processing and ultra-processing of the modern food scene, such concerns are heightened in particular. Navigating modern food systems and fostering long-term health demands functional nutrition literacy, or the ability for people to understand sophisticated diet facts. The study proves the significance of integrating practical nutrition education into undergraduate studies. Upgrading the skills of reading food labels, identifying chemical additives, and being informed in making the right choices of food in terms of content will significantly influence the food decisions and minimize the health risk of chemicals. These findings suggest that while basic awareness exists, it is inconsistently applied, reflecting a surface-level understanding of nutrition. The high percentage of neutral responses may point to limited confidence or passive engagement with food-related information. These patterns are concerning in light of growing dietary exposure to processed foods and synthetic additives, where functional literacy serves as a key determinant of informed decision-making.

Based to the interactive nutritional literacy (INL) study, the majority of students (68.3%) actively look for nutrition-related information via websites and applications. However, 65.9% of students rarely talk about diet with friends or family, compared to just 18.3% who do so often. Both willingness to consult health experts (35.4% agreed/strongly agreed) and participation in online forums and discussions were modest (48% agreed/strongly agreed). Based on the information obtained, around one-third (31.9%) had altered their eating habits. Nearly half (48.9%) demonstrated little initiative in critically assessing online nutrition material, while having high levels of digital literacy.

The findings suggest overall low to moderate critical nutritional literacy of respondents. More than three-quarters of respondents (77.4%) disagreed or strongly disagreed with the statement that they critically appraise nutrition information from media, and fewer than a quarter (23.7%) endorsed the statement. Correspondingly, only 26.3% tried to influence their peers' healthy eating behaviour and more than half (50.9%) did not. More than half (53.6%) the students disregarded newspapers and magazine advice, although 20.8% found it influential. The inclination to participate in political issues targeted at improving people's diet was moderate (35.8%), however one third of students answered neutrally. Only 26.1% reported that they believe in scientific evidence in nutrition information and 43.3% deny it. Political participation in relation to dietary factors within Kerala was also low, with 34.7% of participants who would be willing to be part of this and 42.1% who would not.

The results indicate that students generally perceive food additives and processed foods as health risks. A majority (59.9%) agreed or strongly agreed that food additives could harm long-term health, and 66.4% reported actively avoiding processed foods due to concerns over artificial ingredients. Emotional responses were evident, with 46.6% expressing anxiety after consuming preservative-containing products. Nutritional skepticism was high: 74.8% believed processed foods are less nutritious than fresh options. However, trust in food labels was mixed—only 44.7% trusted labelling related to additives. Additionally, 63.2% reported avoiding foods with long ingredient lists, reflecting a reliance on visual cues and heuristic judgments when assessing food safety.

The correlation between gender and risk perception (ρ = +0.09, p = 0.182) was weak and statistically non-significant. This suggests that male and female students exhibit comparable levels of perceived risk regarding food additives and processed foods. Although females recorded slightly higher mean perception scores (3.57) compared to male (3.49), the difference was not strong enough to indicate a gender-based variation in overall awareness or concern.

Discussion

The study underscores the need for integrated nutrition education within higher education to strengthen foundational knowledge. Improving students' ability to interpret labels, recognize chemical additives, and make informed dietary choices is critical to reducing chemical health risks. Institutions should consider tailored interventions—such as digital tools, label-reading workshops, and culinary skill-building—to enhance food agency and literacy. Functional nutrition literacy not only influences personal health behaviors but also underpins broader public health goals by empowering individuals to navigate increasingly complex and chemically-laden food environments. **Critical nutritional literacy** was generally low. Most students did not critically assess media-based nutrition claims or value scientific evidence when interpreting dietary information. There was also limited initiative in promoting healthy eating within peer groups or engaging in policy-level actions. Overall, while digital access to nutrition information is high, the study highlights significant gaps in critical thinking, informed decision-making, and practical application.

Conclusion

These findings underscore the urgent need for integrated, evidence-based nutrition education in college settings—programs that not only convey information but also develop students' analytical skills, self-efficacy, and ability to engage with both personal and societal dietary issues.

Acknowledgement

References

1. Seo S, Lee S (2021) Key drivers and outcomes of food risk safety perception: A meta-analysis. *Food Qual Prefer* 87: 104040.

2. Lee SY, Kim JY, Hong IS (2019) Trends in parents' perceptions of food

additives in South Korea: Analysis of surveys from 2014 to 2018. *Nutr Res Pract* 13: 515-524.

3. Saxena T, Gautam S (2020) Consumers' perception of food additives and health risks in India. *J Food Sci Technol* 57: 2956-2962.

4. 4.Vassallo M, Piqueras-Fiszman B, Turrini A (2016) European consumers' attitude towards food additive use: A cross-country perspective. *Food Control* 65: 53-61.

5. Yılmaz T, Gökmen V (2022) Determining the knowledge level of students on food additives. *Cyprus J Med Sci* 7: 483-490.

6. Góngora A, Velasco B (2021) Risk perception and avoidance intention due to nutritional warning labels on processed foods in university students. *Int J Environ Res Public Health* 18: 6938.

7. Silva P, Souza AR, Damasceno NRT (2023) Nutrition and food literacy: Framing the challenges to healthy eating. *Nutrients* 15: 2496.

8. Korkmaz S, Göktürk O (2021) Distribution of students' perceptions on the safety of processed foods: An evaluative study. *Food Sci Technol* 41: 350-357.

9. Mertens E, Markey O, Geelen A (2022) The relationship between nutrition literacy and healthy dietary patterns in students. *Int J Environ Res Public Health* 19:11720.

10. Chen T, Huang L (2021) The impact of information on consumers' risk perception and willingness to accept food additives. *Food Control* 125: 108004.

11. Giaretta M, Sillani S (2018) Consumers' perceptions of food risks: A snapshot of the I talian Triveneto area. *Ital J Food Saf* 7: 6977.

12. Han C, Kim J, Lee J (2022) Sociodemographic factors and their impact on nutrition knowledge among university students. *Nutrients* 14: 1121.

13. Srour B, Fezeu L, Kesse-Guyot E, Viallon V,Codova R, et al. (2023) Consumption of ultra-processed foods and risk of multimorbidity of cancer and cardiometabolic diseases: A multinational cohort study. *Lancet Reg Health Eur* 35: 100771.

14. Hagmann D, Siegrist M (2020) Nutri-Score, multiple traffic light and incomplete nutrition labelling on food packages: Effects on consumers' accuracy in identifying healthier snack options 83: 103894.

15. Alshahrani NZ,Bafaraj Ag, Almari HM (2024) Exploring university students' nutrition literacy in Saudi Arabia and its association with eating habits. *Front Nutr* 11:1425650.

16. Yahia N, Brown CA, Rapley M, Chung M (2016) Level of nutrition knowledge and its association with fat consumption among college students. BMC Public Health 16: 1047.